

What is claimed is:

1. A membrane device comprised of:

a porous monolith support formed from a reaction-bonded ceramic powder, fired in an oxygen-free atmosphere, the monolith defining a plurality of passageways, having passageway walls, extending longitudinally from one end face of the monolith to an opposing end face; and

a semipermeable membrane suitable for separating a feedstock into permeate and retentate applied to the passageway walls.

2. The device of claim 1 in which the semipermeable membrane is selected from the group of membranes suitable for microfiltration, ultrafiltration, nanofiltration, pervaporation, reverse osmosis, and gas separations.

3. The device of claim 1 in which the shrinkage of the monolith during firing is less than about five per cent.

4. The device of claim 1 in which the reaction bond material is silicon nitride and the bond is formed by nitridation of a silicon-containing precursor.

5. The device of claim 4 in which the silicon-containing precursor is selected from the group of silicon, silica, silicon oligomers, or mixtures thereof.

6. The device of claim 4 in which the ceramic powder is selected from the group of silicon carbide, silicon nitride, alumina, mullite, zircon, zirconia, titania, magnesia, and mixtures thereof.

7. The device of claim 1 in which the reaction bond material is silicon carbide and the bond is formed by carbide formation with a silicon-containing precursor.

8. The device of claim 7 in which the silicon-containing precursor is selected from the group of silicon, silica, silica oligomers, or mixtures thereof.

9. The device of claim 7 in which the ceramic powder is selected from the group of silicon carbide, silicon nitride, alumina, mullite, zircon, zirconia, titania, magnesia, and mixtures thereof.

10. The device of claim 1 in which the reaction bond material is SiAlON and the bond is formed by nitridation of aluminum and silicon containing precursors.

11. The device of claim 10 in which the ceramic powder is selected from the group of silicon carbide, silicon nitride, alumina, mullite, zircon, zirconia, titania, magnesia, and mixtures thereof.

12. A method for making a membrane device, comprising

- making a mixture containing a ceramic powder and a reactive binder precursor;
- forming a monolith defining a plurality of passageways, having passageway walls, extending longitudinally from one end face of the monolith to an opposing end face;
- drying said monolith to form a green monolith;
- firing said green monolith in an oxygen-free atmosphere to react the reactive binder precursor with a gas, liquid or solid reactant to create a reaction bonded monolith membrane support;
- cooling said reaction bonded monolith support; and
- applying a semipermeable membrane to the passageway walls of said monolith support to form a membrane device.